

What is claimed is:

1. A method of distributing water in an array comprising a plurality of electrochemical fuel cell stacks, wherein said plurality of fuel cell stacks each comprise at least one fuel cell
5 assembly comprising an ion-exchange membrane interposed between a cathode and an anode, said method comprising utilizing water accumulating in an oxidant stream flowing through said plurality of fuel cell stacks by periodically reversing the oxidant stream flow direction within oxidant passages within at least one of said plurality of fuel cell stacks.

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2. The method of claim 1 further comprising controlling the temperature profile within said oxidant stream so that oxidant stream temperature generally increases in the flow
5 direction.

3. The method of claim 2 comprising periodically reversing the flow direction of a coolant fluid flowing through each of said plurality of fuel cell stacks.

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4. The method of claim 1 further comprising periodically reversing the flow direction of a fuel stream flowing through said plurality of fuel cell stacks to prevent said

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3 5 fuel stream flow direction from being
176 substantially concurrent with said oxidant stream
flow direction.

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5. The method of claim 4 wherein said fuel stream is directed to flow in a direction substantially opposite to the oxidant stream flow direction within said fuel cell assemblies.
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6. The method of claim 1 further comprising releasably capturing water from said oxidant stream downstream of at least one of said plurality of fuel cell stacks, and releasing at least a portion of said captured water into said oxidant stream upstream of at least one of said plurality of fuel cell stacks.

7. A method of distributing water in an array comprising a plurality of electrochemical fuel cell stacks, wherein said plurality of fuel cell stacks each comprise at least one fuel cell assembly comprising an ion-exchange membrane interposed between a cathode and an anode, said method comprising utilizing water in a fuel stream flowing through said plurality of fuel cell stacks by periodically reversing the fuel stream flow direction within fuel passages within at least one of said plurality of fuel cell stacks.

8. The method of claim 7 further comprising periodically reversing the flow direction of a coolant fluid flowing through each of said plurality of fuel cell stacks.

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5 9. A method of distributing water to an ion-exchange membrane in an electrochemical fuel cell utilizing water in a substantially poison-free fuel stream, said method comprising periodically reversing the direction of flow of said fuel stream through said fuel cell.

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10. The method of claim 9 further comprising periodically reversing the flow direction of a coolant fluid flowing through said fuel cell.

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11. A method for distributing water to an ion-exchange membrane in an electrochemical fuel cell utilizing water accumulating in an oxidant stream in an oxidant flow field associated with a 5 cathode of said fuel cell, said method comprising:

periodically reversing the flow direction of said oxidant stream through said oxidant flow field; and

10 controlling the temperature profile within said oxidant stream so that oxidant stream temperature generally increases in the flow direction.

12. The method of claim 11 comprising periodically reversing the flow direction of a coolant fluid flowing through said fuel cell.

13. An electrochemical fuel cell assembly comprising an ion-exchange membrane interposed between a cathode and an anode, said assembly further comprising:

5 an oxidant flow field associated with said cathode for directing an oxidant stream to said cathode between a first oxidant flow field port and a second oxidant flow field port;

10 a fuel flow field associated with said anode for directing a fuel stream to said anode between a fuel stream inlet port and a fuel stream outlet port;

15 a coolant system comprising at least one coolant passage associated with said fuel cell for receiving a coolant fluid which flows through said at least one coolant passage;

20 an oxidant stream flow switching device for periodically reversing the direction of flow of said oxidant stream between said first and second oxidant flow field ports; and

25 a coolant fluid flow switching device for periodically reversing the direction of

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flow of said coolant fluid through said at least one coolant passage.

14. The electrochemical fuel cell assembly of claim 13 further comprising a controller for operating said oxidant flow switching device and said coolant fluid flow switching device such 5 that said oxidant stream flows through said fuel cell substantially concurrently with said coolant fluid.

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